ESSC Washington Update

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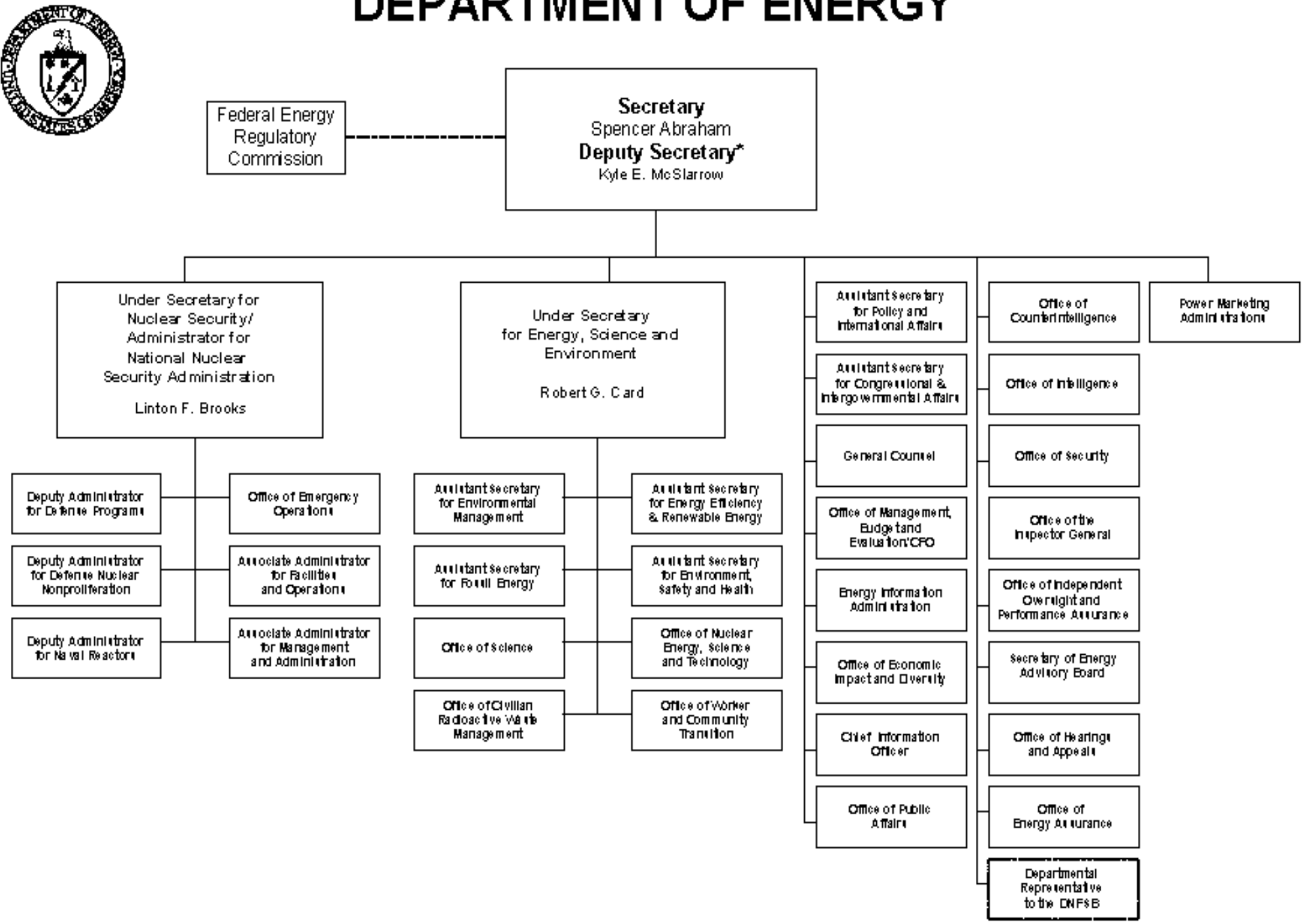
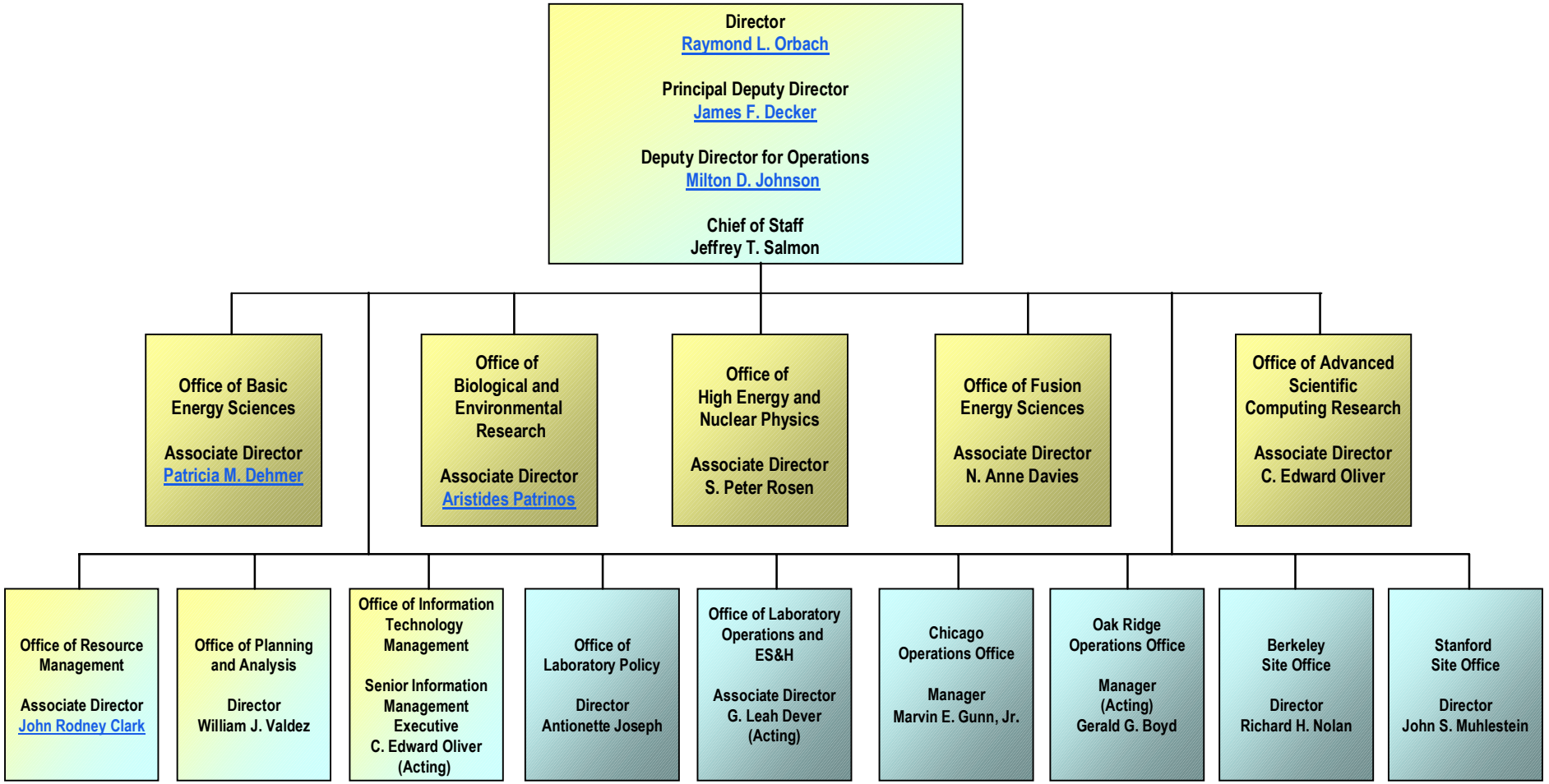
ESnet Program Manager
Department of Energy

18 March 2003
Bethesda, MD

DEPARTMENT OF ENERGY



Office of Science



NOTE: Director of Science equivalent to Assistant Secretary position and filled by Presidential Appointment (Senate confirmed); Principal Deputy Director equivalent to Principal Deputy Assistant Secretary; Associate Directors equivalent to Deputy Assistant Secretaries

Approved: _____
Raymond L. Orbach
Director
Office of Science

ASCR/MICS Mission

Discover, develop, and deploy the computational and networking tools that enable researchers in the scientific disciplines to analyze, model, simulate, and predict complex physical, chemical, and biological phenomena important to the Department of Energy (DOE).

Research:

foster and support fundamental research in advanced scientific computing – applied mathematics, computer science, and networking

Facilities:

operate supercomputers, a high performance network, and related facilities.

http://www.sc.doe.gov/ascr/mics/

Interagency Committees

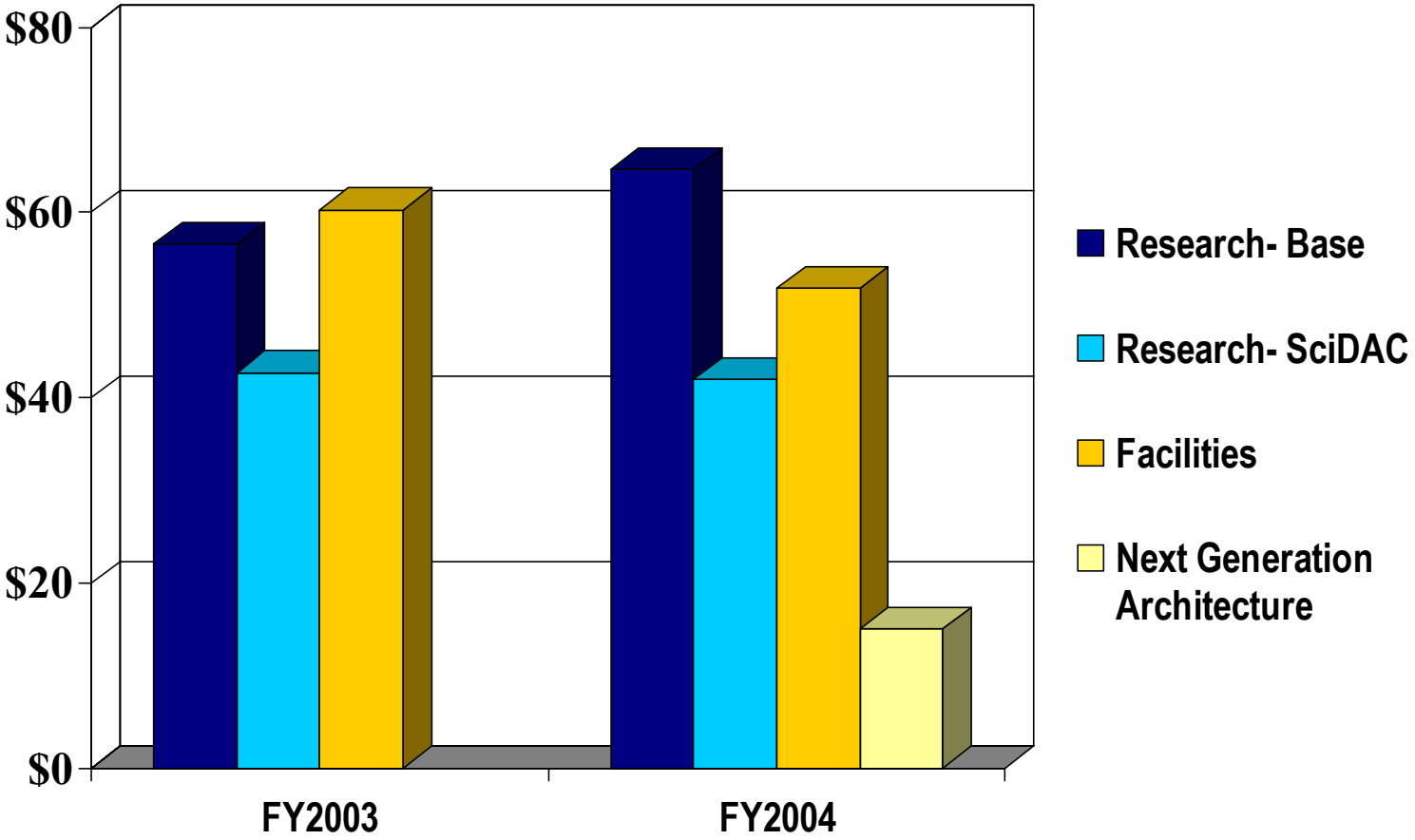
- **Purpose**
  - **Large Scale Networks (LSN)**
    - Assure U.S. technological leadership in communications through R&D that advances the leading edge of networking technologies and services
  - **Joint Engineering Team (JET)**
    - Coordinates networking technical activities, operations, and plans, between multiple Federal agency networks an Internet 2
  - **Network Research Team (NRT)**
    - Future technologies network research activities
  - **Middleware and Grid Infrastructure Coordination Team (MAGIC)**
    - Coordinate Middleware and grid efforts

Secretary of Energy Unveils DOE '04 Budget

- In this budget, the department requested $170.5 million for the Advanced Scientific Computing Research (ASCR) program. …
- Within Biological and Environmental Research, the Genomes to Life program which funds research to address energy, environmental, and national security needs, continues to expand from $34.5 million to $59 million in FY 2004, as a research program on the leading edge of biology.

MICS Budgets
$ in millions

FY2003 Approp. - $164.480
FY2004 Request- $170.490



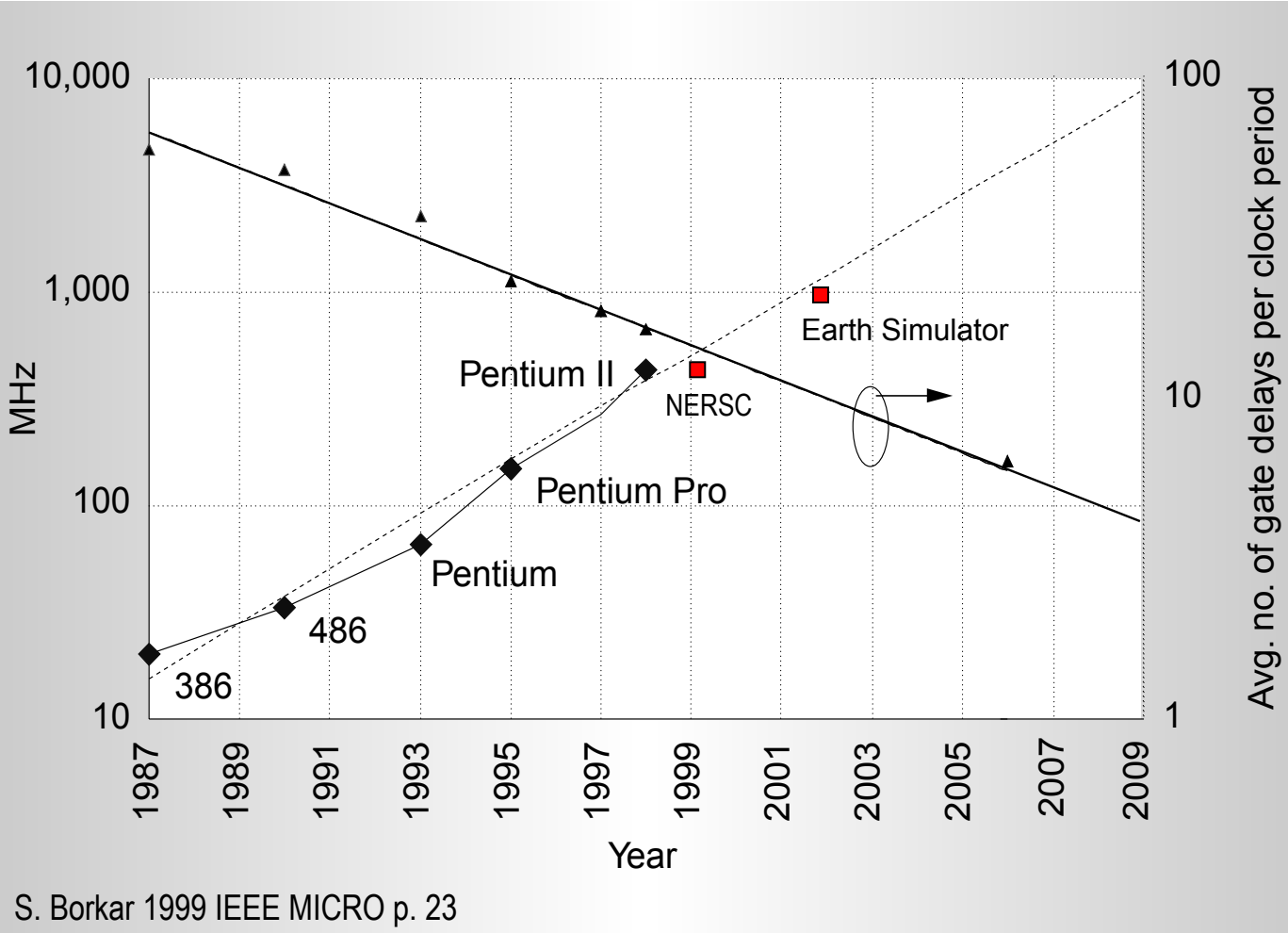
ESnet FY03 (LBNL)

	FY03	FY02	FY01	FY00
• ESnet ATM Contract	$7M	$7M	$7M	$7M
• ESnet Operations	$6.5M	$6.5M	$6.5M	$5.5M
• ESnet International	$1.2M	$1.2M	$1.2M	$1.1M
• ESnet Video	$350K	$350K	$350K	$300K
• ESnet (DSG) Testbed	$0.0	$0.0	$1M	$1M
• ESnet Equipment	$900K	$660K	$900K	$1.5M
• ESnet PKI/Directory Svc	$250K	$1M	$0.0	N/A
• ESnet Upgrades	$0.0	$1.5M	$1M	$0.0
• ESnet OC192 Hardware	$700K	N/A	N/A	N/A

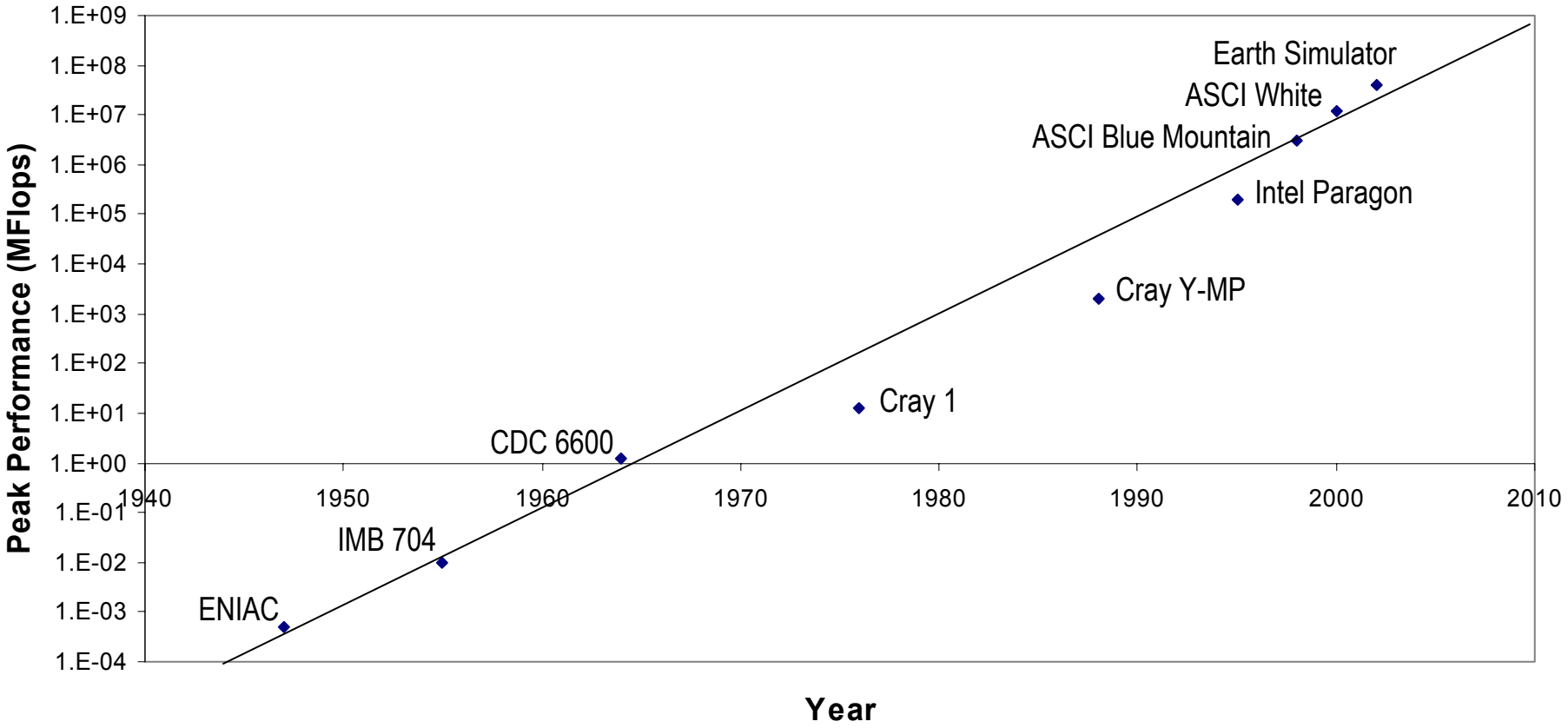
Budget and Site Upgrades and Site Requests

- **Flat funding Scenarios**
  - Site upgrades
    - Documented "What if" scenarios – run thru ESSC/ESCC
    - Maximize existing ESnet capabilities
- **Need to Prioritize all requests (Process!!)**
  - Guidelines / Timelines
  - Sites/programs in coordination with ESSC program representatives and/or ESSC chair need to submit detail justification to:
    - ESSC and ESCC (Larry Price/Bill Wing)
    - DOE HQ (G. Seweryniak)
    - ESnet Project mgr (Jim Leighton)
    - DOE HQ Program support is critical (Program mgr)
    - ESSC representative needs to be prepared to support it at ESSC

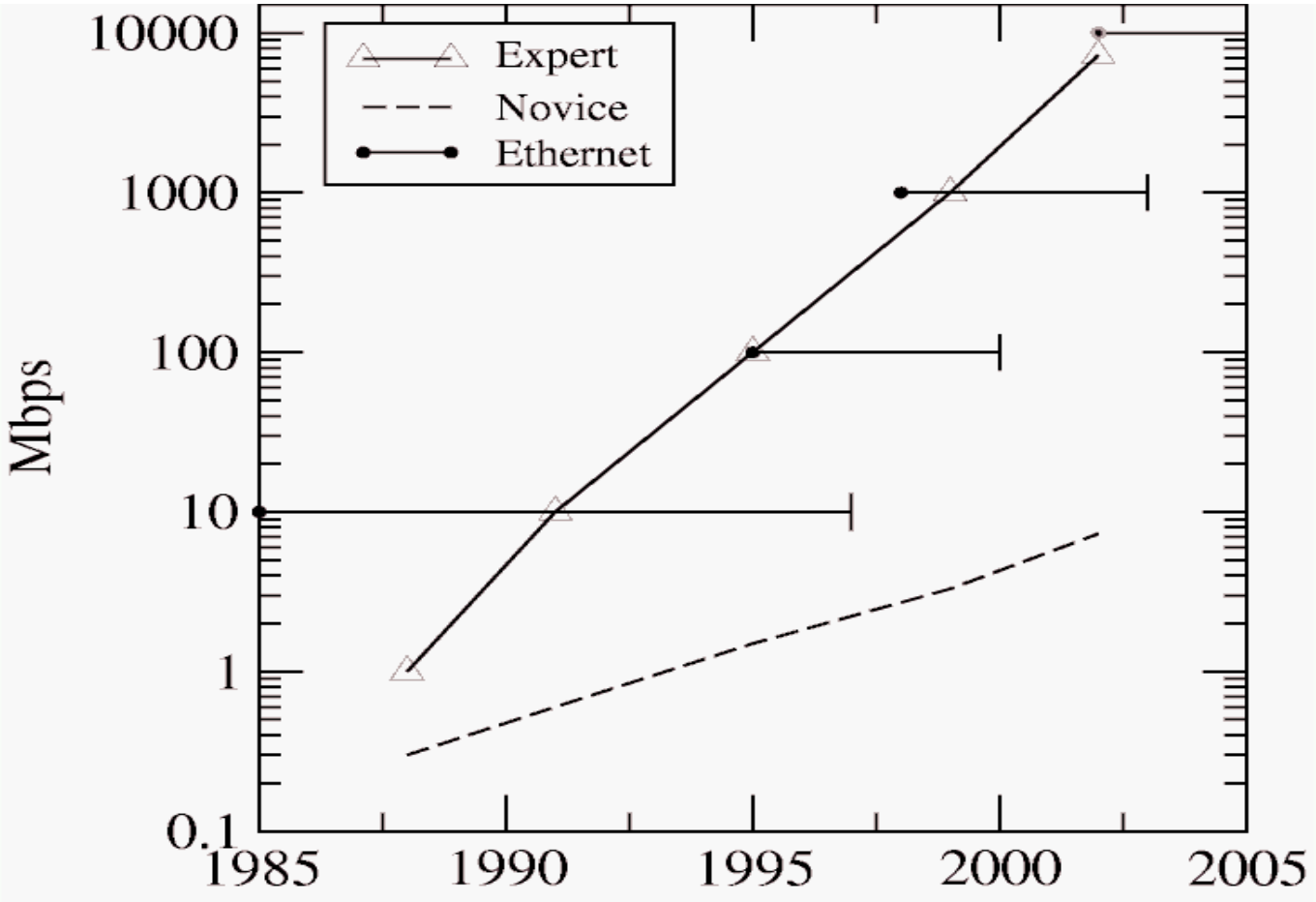
Processor Frequency Doubles Each Generation

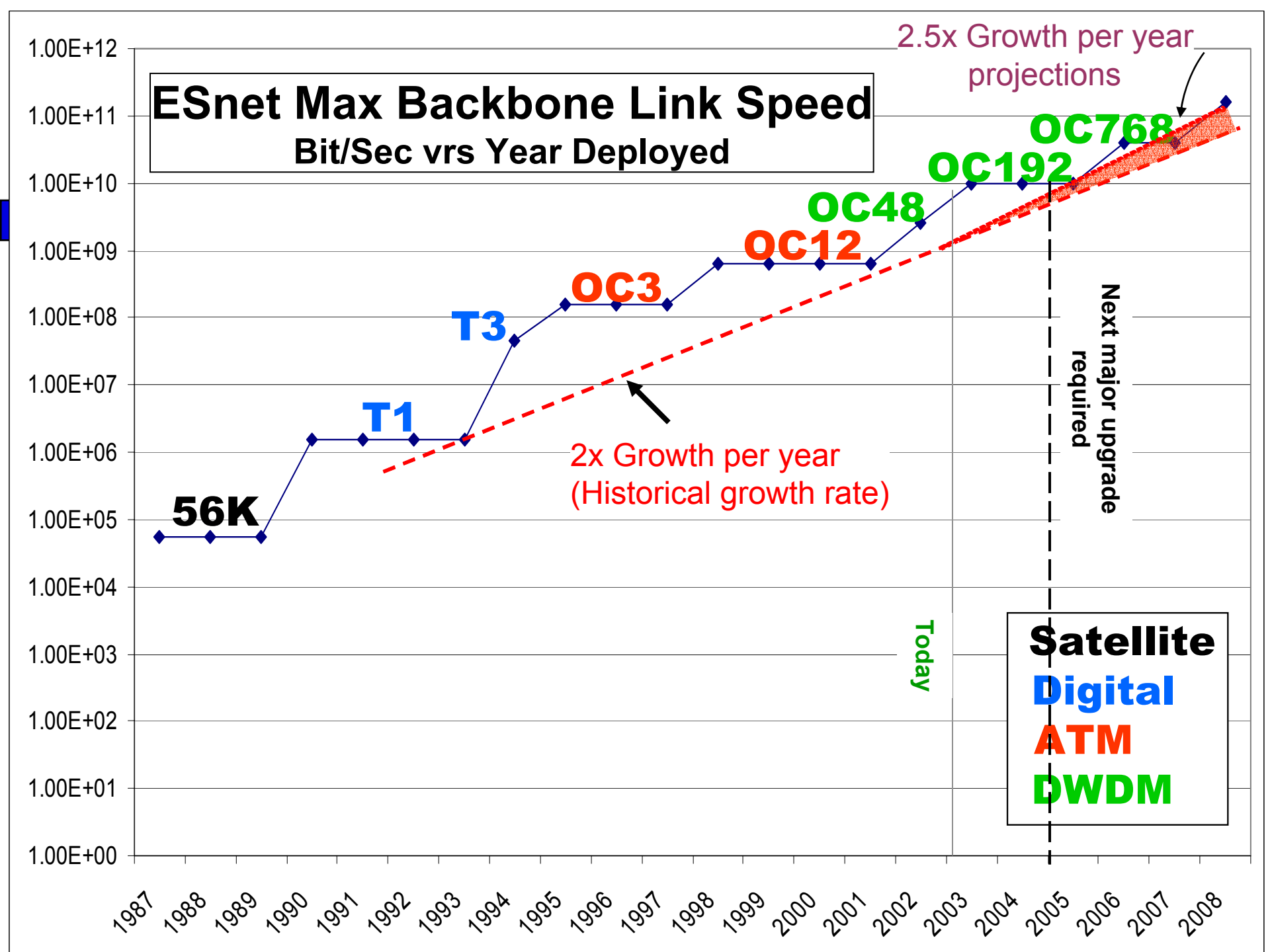


Historical Trends in Peak Computer Performance



Network GAP


Expert
Novice
Ethernet
Mbps
10000
1000
100
10
1
0.1
1985
1990
1995
2000
2005


ESnet Max Backbone Link Speed
Bit/Sec vrs Year Deployed
2.5x Growth per year projections
OC768
OC192
OC48
OC12
OC3
T3
T1
56K
2x Growth per year
(Historical growth rate)
Next major upgrade required
Today
Satellite
Digital
ATM
DWDM
1.00E+12
1.00E+11
1.00E+10
1.00E+09
1.00E+08
1.00E+07
1.00E+06
1.00E+05
1.00E+04
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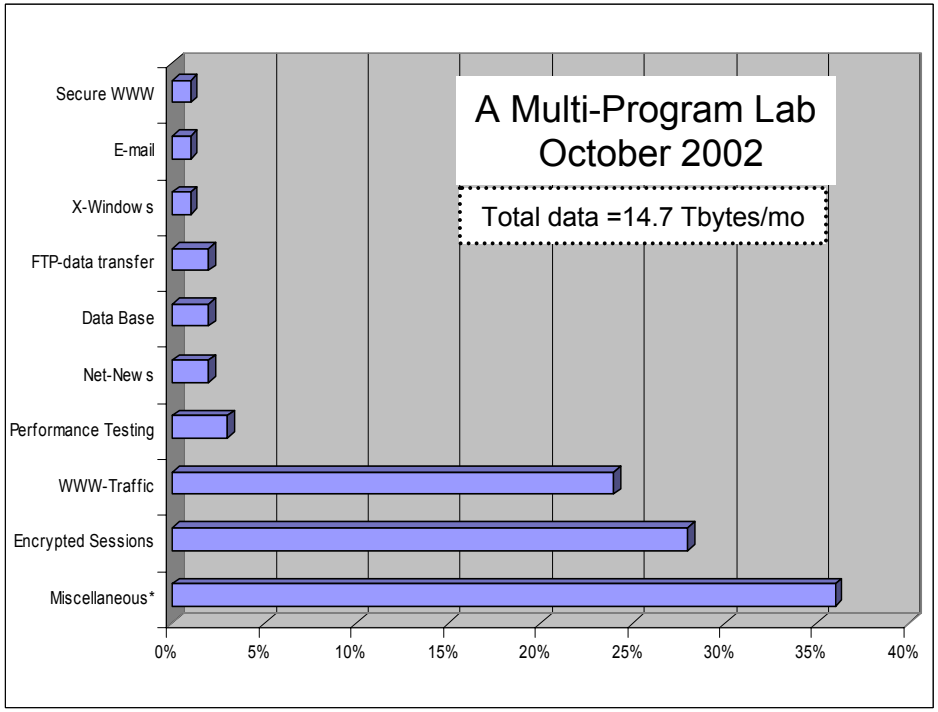
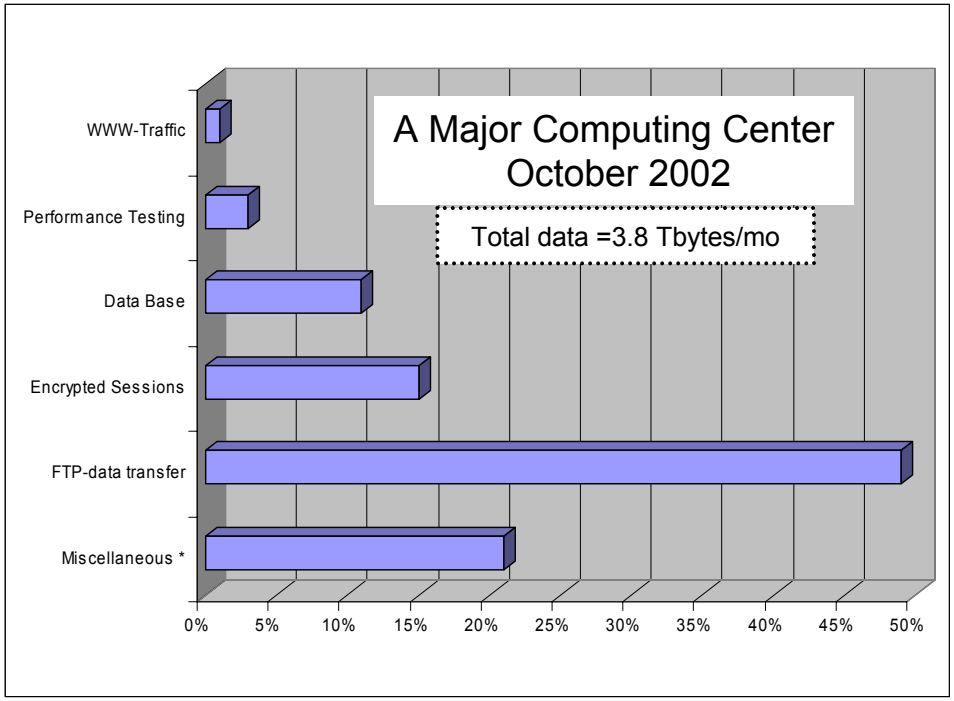
ESnet Performance Monitoring

- Need to monitor traffic for Science
  - Not just raw BW
  - What data is important to tell the Science Story
  - What is the best way to display it
- ESnet is a great network – but….
  - How is it supporting the DOE Science mission
    - In layman's terms
    - Where does it need to be by 2008
    - What services will be needed by 2004 to 2008
    - What are the critical drivers
      - Applications
      - Experiments
      - Programs
- Send info to seweryni@er.doe.gov and wingwr@ornl.gov



Future Projections

- **Programmatic projections indicate that massive file transfers will be the drivers for performance enhancement over the next 5 years.**
  - **Accordingly it would be anticipated that the typical profile will become more like the NERSC profile as data transfers become the dominant network traffic source.**
- **A second major source will become H.323 based conferencing and collaboration tools**
- **It is also likely that steadily increasing demands for high performance will necessitate new applications, network services, and protocols that are not yet available.**



Comments

- **These graphs represent usage from two different ESnet sites, a multi-program lab and a major computing center.**
- **The application generating traffic is not directly identifiable by the network, therefore:**
  - **The application is deduced from the "port numbers" used across the network**
  - **However, there is not always a unique or registered mapping from port to application**
- **Any port/application that represents less than 1% of the traffic is included in the "miscellaneous" category**
- **"Encrypted Sessions" are Secure Shell sessions**

ESnet Technology Roadmap – Why ESnet???

- What functions does ESnet perform for DOE Science that cannot be obtained elsewhere
- What sets ESnet apart from other networks/ISPs
- How do we get applications developers to better project network infrastructure needs
- What new technologies does ESnet need to plan for
- How does ESnet address the end-to-end problem and not just the backbone
- What is the best way to work/encourage network research for the ESnet future technologies for Science
- What story should ESnet carry forward for DOE/Congress etc…..
- Need to publish a report!!!! (by Aug 2003)

What ESnet needs to do

- Complete OC192 backbone upgrade
- Setup task force to gather/process data on performance monitoring (AUP changes?)
- Position itself for next upgrade within 2 years
  - Need to develop ESnet story for Science (NOW)
  - Put a placeholder for 2005 funds (amount????)
- Hold workshops
  - Enumerate future requirements
  - Create Network Environment Roadmap
  - Gather Program office support
    - Requires help from program reps and ESSC/ESCC chairs
  - Garner Program Office Support
    - HQ and site visits by ESSC/ESCC/HQ
- Generate Technology Roadmap Document